

working order and vigorously constituted, has not ceased from signalling to the brain ever more and more insistently for years : " We are not content ; we are idle ; we are *sitting still* ; we are not functioning ; we are aching from sitting still." The brain misinterprets all this straight away, and transmits it to consciousness as follows : " What a bore life is ! *When* is anything interesting or exciting going to happen ? What are all the men in my circle doing ? Why don't they notice me or fall in love with me ? " The messages continue persistent, and they are the same as in the first case, but more emphatic, more urgent. Again the brain transmits them to consciousness as follows : " What a bore *home* life is ! What a self-complacent, heedless creature mother is ! What a tedious round this week at home has been ! I must go out ; I must get away from it ! I must leave home ! Couldn't I study something ? Anything that gets me out of this tiresome futility ! Isn't there a course of something at the School of Political Economy ? " And so on !

The book is to be recommended for its entertaining discussions of topics raised in feminist controversies ; we could wish that the author had entered more carefully into the historical aspects and had shown a better acquaintance with scientific facts. His solution of sex problems by improving the *men* has much to recommend it.

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Newman, Horatio Hackett. *The Physiology of Twinning*. University Press, Chicago, 1923. pp. 230. \$1.75.

" TWINNING is essentially a process of regulation or regeneration of a whole individual out of a prospective half individual." (p. 3). Concordantly with this definition three classes of twins are recognised according to the stage at which fission takes place :—

- (a) Fission of blastoderm before axis of symmetry is laid down.
- (b) Production of two or more axes through plural gastrulation.
- (c) Bilateral fission of the right and left hand primordia of a single embryonic axis.

The case of the armadillo regularly bearing 4, or in other species 8 young of the same sex at a birth is placed in class (c). The author strenuously objects to the use of the terms "polyembryony" and "budding" for this process, and suggests that Patterson and Stockard have been misled by mistaking "the beginnings of amniotic outpouchings which are destined to act as migration canals," for new head regions.

Case (b) appears to be easily producible in starfishes by delaying development ; it is not clear, however, that such starfish larvae ever give rise to two adults. In the earthworm, *Lumbricus trapizoides*, twinning is normal, but this case would seem to fall under (c).

To condition (a) is ascribed the "dwarf larvae" found in starfish, which never complete development ; it is thought also to be possible, though extremely rare, that in fishes such twins should separate when hatched. Ordinary fish twins appear to be either double monsters, or embryos joined only by the yolk sac, all of which Gemmill attributes to plural gastrulation, but Newman suggests that the former with some of the latter are due to the fission (partial or complete) of the right and left hand primordia of a single axis.

When we come to "The most obscure and least understood cases of twinning, as that in man" (p. 8), described in chapter IX, the interest is mainly concerned with double monsters and conjoined twins. Current theory requires that three quarters of human multiple births should be excluded from the category of twins as physiologically defined, but the remaining quarter of normal healthy and separate twins are far more numerous than the double monsters. Are they, 40% of twins of like sex, produced by a process of fission such as is probably responsible for double monsters? For the latter there are strong reasons for assigning fission of a single embryo as their origin (i) they are always of like sex (ii) they are joined in symmetrical positions and homologous parts are always united (iii) they very frequently show *situs inversus viscerum*, the partial or total symmetrical inversion of the heart, liver, blood vessels, etc.

In respect of symmetry reversal in joined twins, it is interesting to learn that (p. 167-8) the left hand individual is always normal in arrangement, while in the right hand individual a completely normal arrangement is, in fact, relatively rare.

The question of symmetry reversal is of importance, for this is an indication of origin by fission which might be expected in separate twins. According to Newman "It is very rare indeed that separate human twins show any signs of *situs inversus viscerum*, but they do not uncommonly show mirror-imaging in certain minor external characters such as finger-prints."

The argument from finger prints is of very different weight from that of mirror imaging of the viscera, since there is no *situs solitus*, or normal condition of the finger prints, and a relatively large proportion of cases might be expected to show some mirror imaging by mere chance. The evidence to which we are referred on this point (The Biology of Twins, p. 159) is very scanty. One pair of twins showed mirror imaging of the two palm patterns, the left hand of *x* corresponds to the right hand of *y*, and *vice versa*. Nothing is said of the finger prints of this pair. Three other cases are cited as examples of symmetry reversal, in which the pattern of a single finger appears normal on the corresponding finger of the twin. Thus the right hand forefinger of *x* shows the reversed pattern of the right hand forefinger of *y*. Since the pattern appears on corresponding and not on opposite sides of the body, it is not easy to regard these cases as analogous to *situs inversus viscerum*. We are thus reduced to a single case of "almost complete" mirror imaging of the palm patterns.

It would be unfair to leave the impression that the inadequacy of the evidence presented on this important point in any way detracts from the value of Newman's book. If better evidence were available we may be sure that he would have put it forward. Having himself done original research on the subject, especially in connection with armadillos, he is no bigoted advocate of the current theory, but as we have indicated, expressly classes human twinning among the most obscure and least understood cases. No statement in the book could be used, without gross misconstruction, to hinder the prosecution of further research on the subject.

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